

FIG. 1A
(Prior Art)

FIG. 1B
(Prior Art)

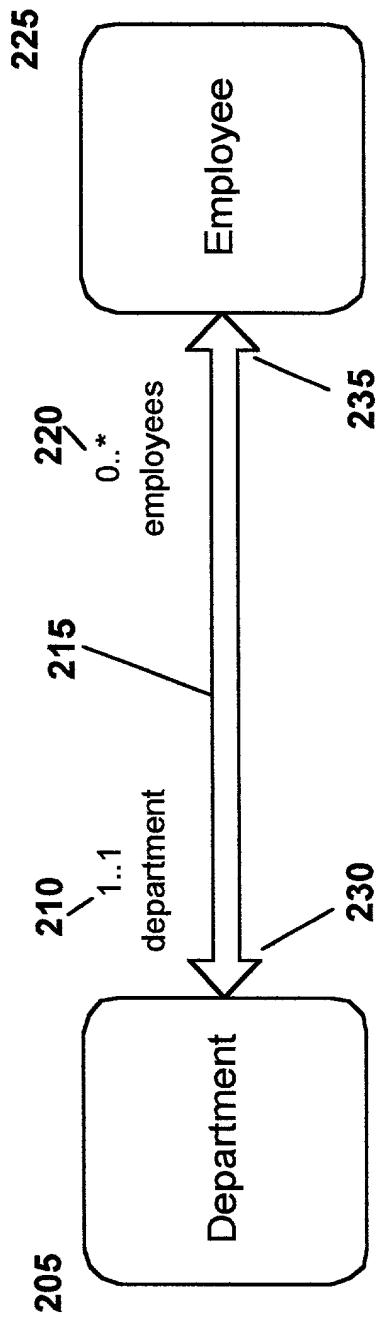


FIG. 2

FIG. 3 (Prior Art)

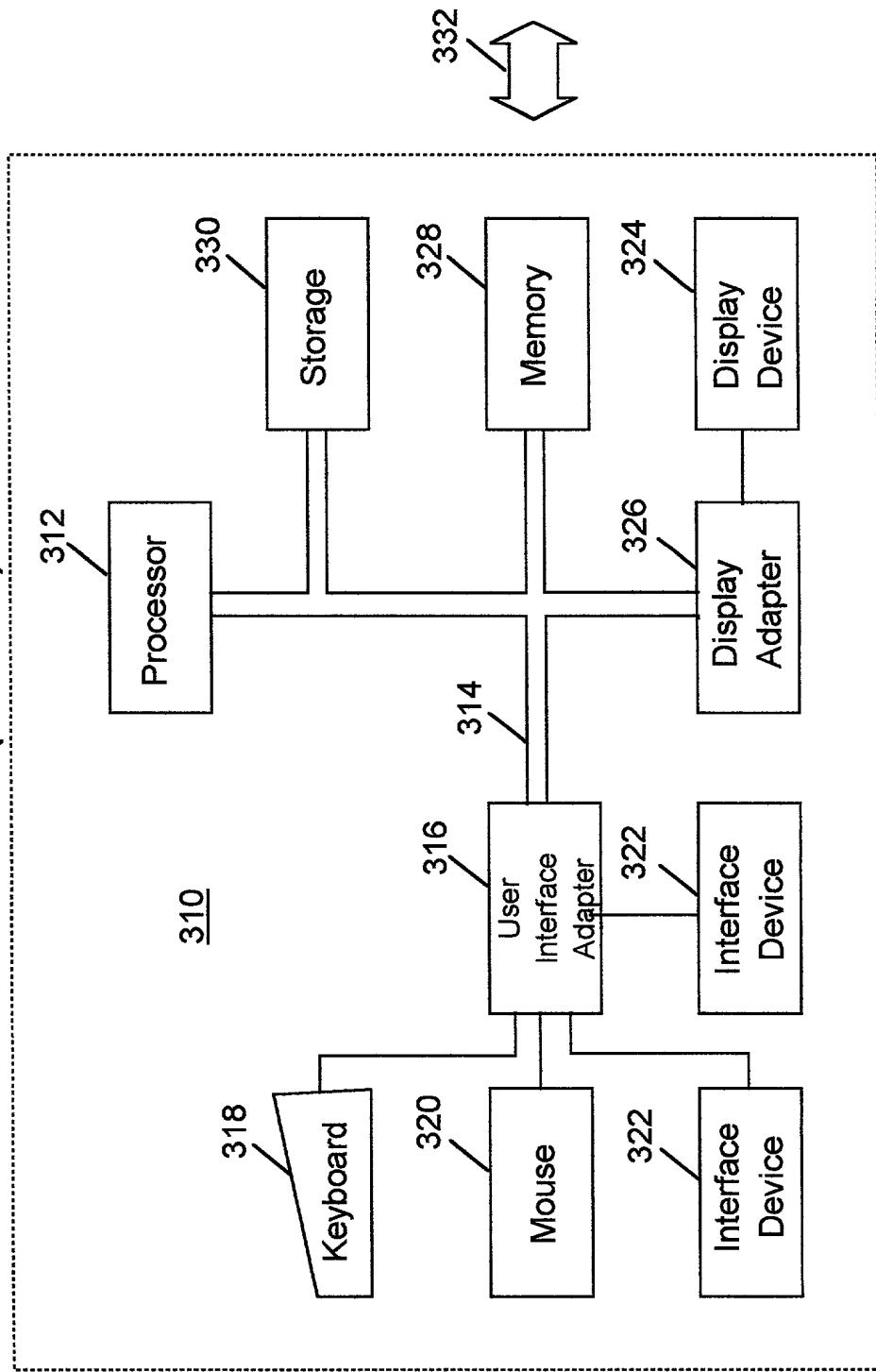


FIG. 4
(Prior Art)

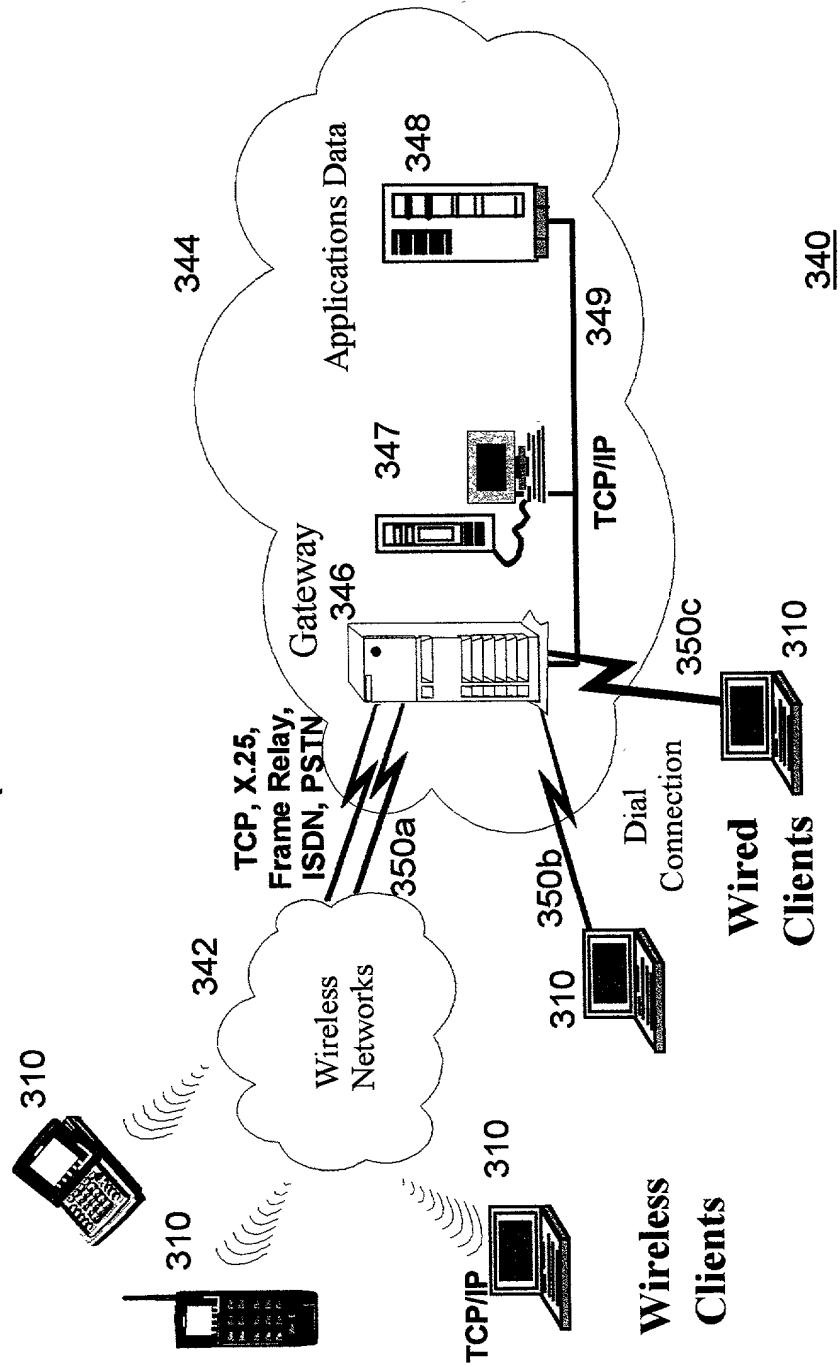


FIG. 5

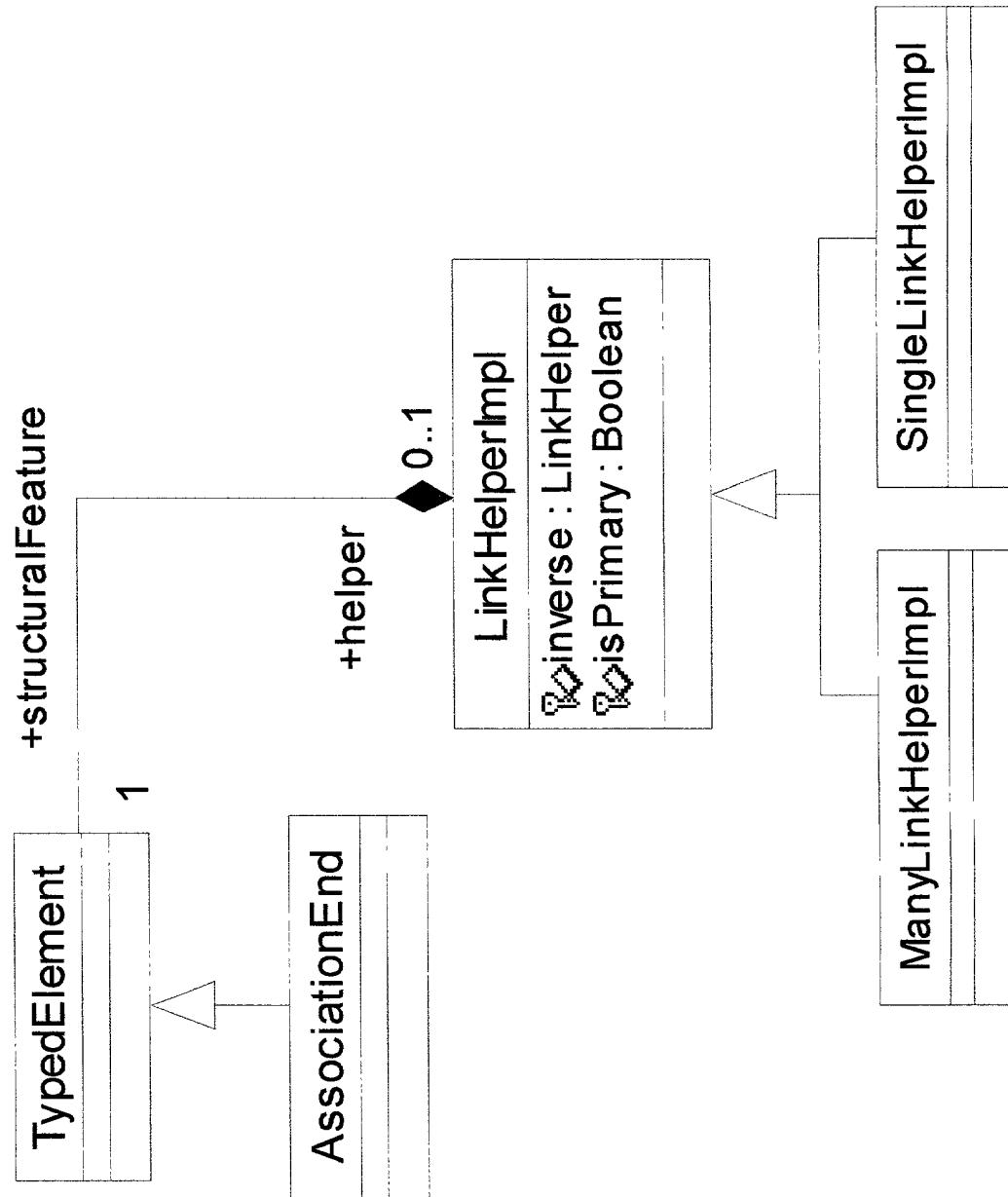


FIG. 6

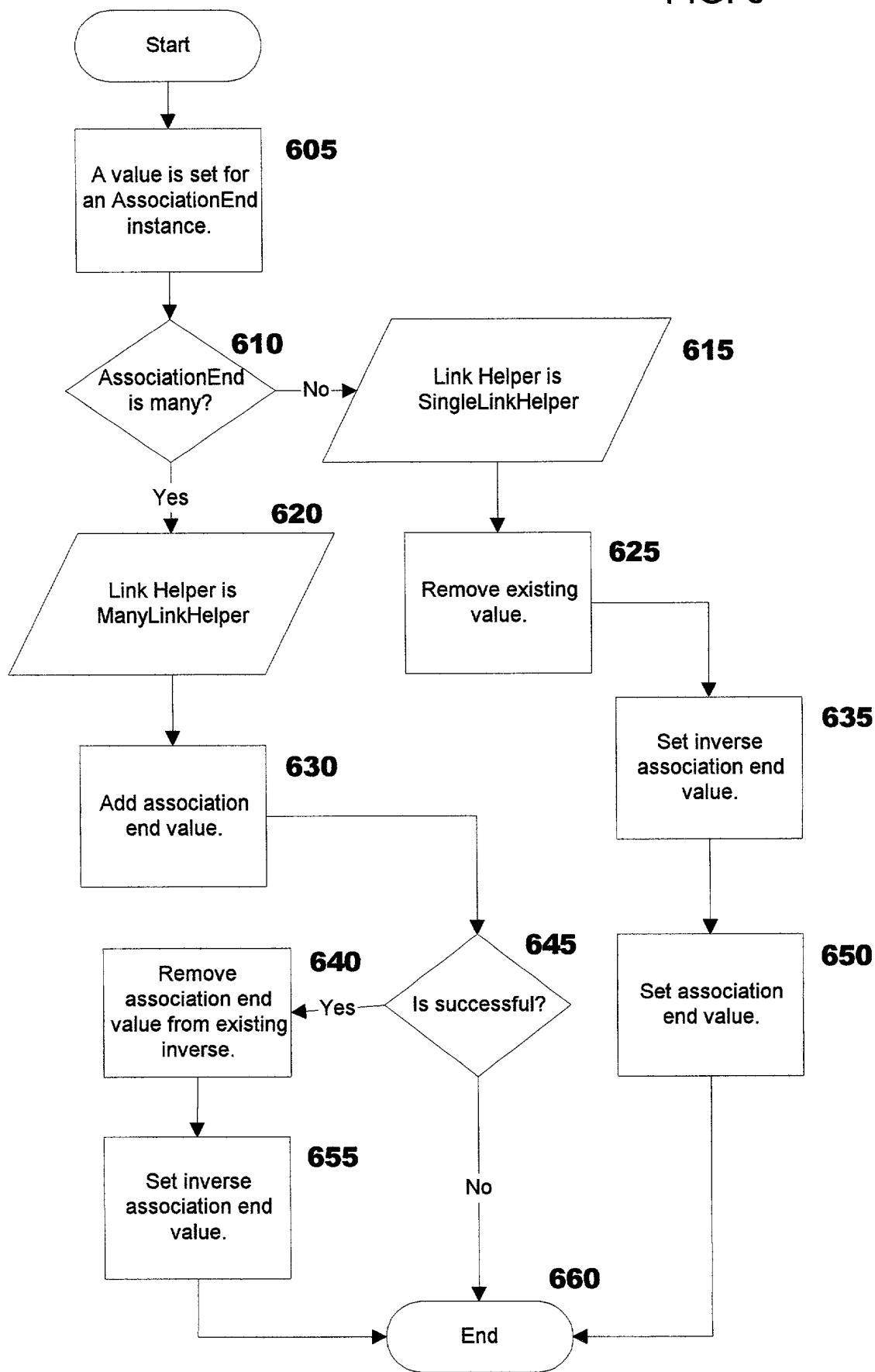


FIG. 7

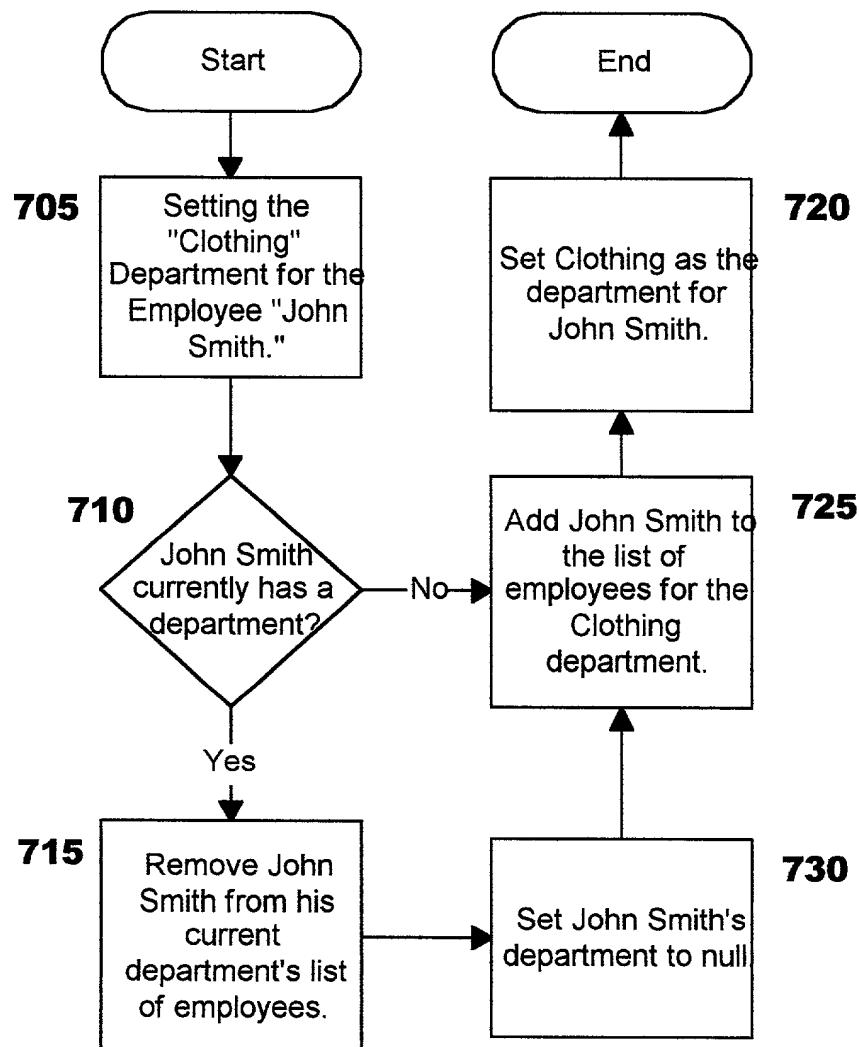
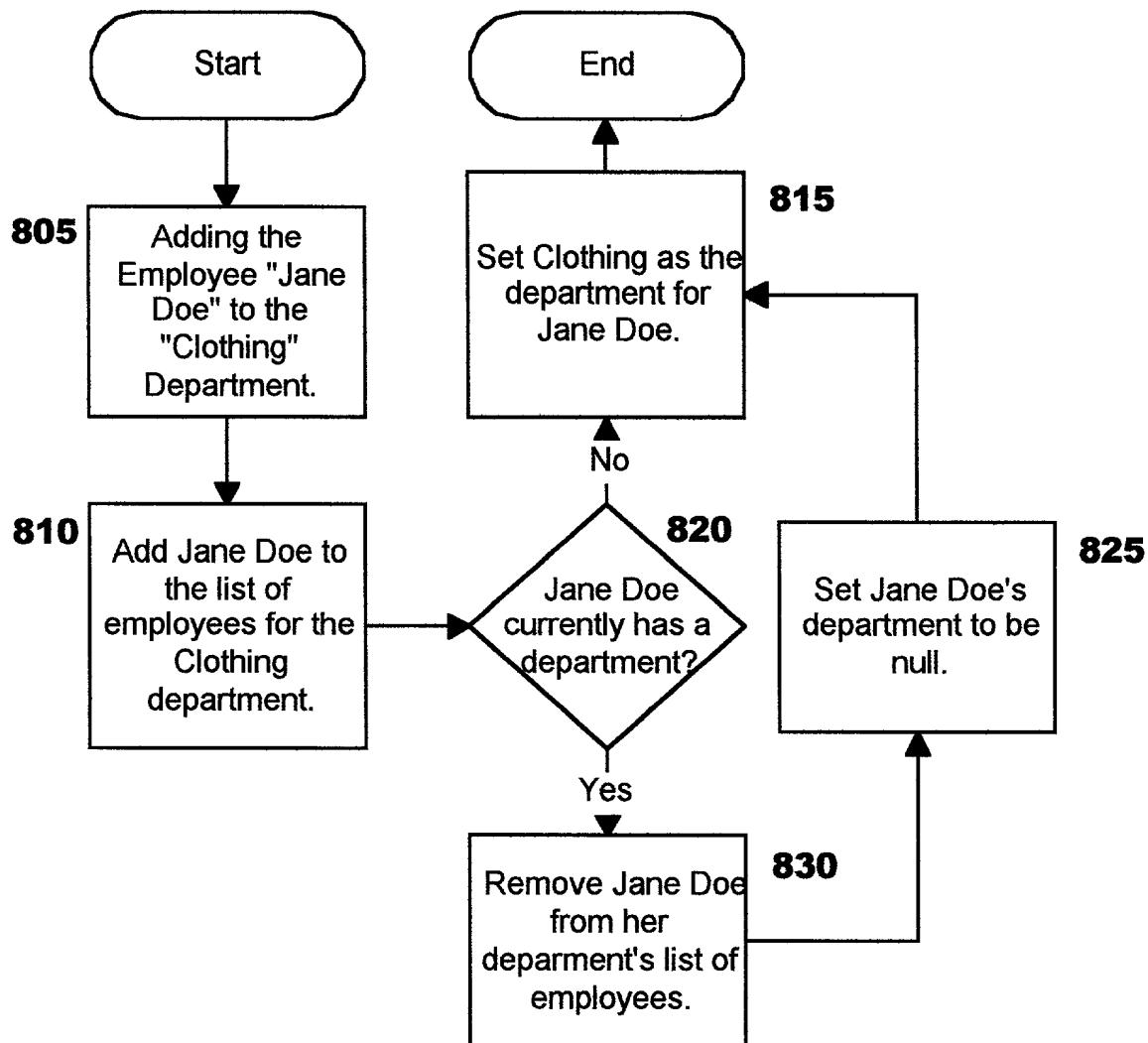


FIG. 8



900

```
<?xml version="1.0" encoding="UTF-8"?>
<XML xmi.version="1.1" timestamp="Mon Sept 20 16:13:08 EST 2000" xmlns:mof="schemas/MOF.xmi">
<XML.header>
<XML.model xmi.name="Company"/>
<XML.metamodel xmi.name="mof" xmi.version="1.0" href="schemas/MOF.xmi"/>
</XML.header>
<XML.content>
<mof:Package xmi.id="Company" name="Company">
<mof:Namespace.contents>
<mof:Class xmi.id="Department" name="Department">
<mof:Namespace.contents>
<mof:Attribute xmi.id="Department_name" name="name">
<mof:Attribute xmi.id="Department_name" multiplicity="1..1" name="name">
<mof:TypedElement.type>
<mof:DataType href="schemas/mof.xmi#String"/>
</mof:TypedElement.type>
</mof:Attribute>
</mof:Namespace.contents>
</mof:Class>
<mof:Class xmi.id="Employee" name="Employee">
<mof:Namespace.contents>
<mof:Attribute xmi.id="Employee_LastName" multiplicity="1..1" name="lastName">
<mof:TypedElement.type>
<mof:DataType href="schemas/mof.xmi#String"/>
</mof:TypedElement.type>
</mof:Attribute>
<mof:Attribute xmi.id="Employee(firstName" multiplicity="1..1" name="firstName">
<mof:TypedElement.type>
<mof:DataType href="schemas/mof.xmi#String"/>
</mof:TypedElement.type>
</mof:Attribute>
```

FIG. 9A

FIG. 9A
FIG. 9B

FIG. 9

```
</mof:Attribute>
```

FIG. 9B

```
<mof:Attribute xmi:id="Employee_title" multiplicity="1..1" name="title">
  <mof:TypedElement.type>
    <mof:DataType href="schemas/mof.xmi#String"/>
  </mof:TypedElement.type>
</mof:Attribute>
<mof:Namespace.contents>
</mof:Class>
<mof:Association xmi:id="DepartmentToEmployees" name="DepartmentToEmployees">
  <mof:Association.associationEnds>
    <mof:AssociationEnd xmi:id="DepartmentToEmployees_employees" multiplicity="0..*"
      name="employees" aggregation="COMPOSITE" type="Employee"/>
    <mof:AssociationEnd xmi:id="DepartmentToEmployees_department" multiplicity="1..1"
      name="department" aggregation="NONE" type="Department"/>
  </mof:Association.associationEnds>
</mof:Association>
</mof:Namespace.contents>
</mof:Package>
</XMI.content>
</XMI>
```

910 **920** **930**

FIG. 10

The diagram illustrates the structure of an XML document. The root node is **1000**, which contains the XML declaration and the root element `<XMl ...>`. The root element has attributes `version="1.0"`, `encoding="UTF-8"`, `xmlns:xmi="http://www.omg.org/spec/XMI/2.0"`, `xmlns:mof="http://www.omg.org/spec/MOF/2.0"`, and `xmlns:Company="schemas/company.xmi"`. The root element contains three child nodes: **1010**, **1010**, and **1020**. The first **1010** node is a `<XMl.model xmi.name="Employees"/>` element. The second **1010** node is a `<XMl.metamodel xmi.name="mof" xmi.version="1.0" href="schemas/MOF.xmi"/>` element. The `<XMl.metamodel xmi.name="Company" xmi.version="1.0" href="schemas/company.xmi"/>` element is the parent of the **1020** node. The **1020** node is a `<XMl.header>` element. The `<XMl.content>` element is the parent of the **1010** node and the **1020** node. The `<Company:Employee xmi.id="E003" firstName="John" lastName="Smith" title="Staff"/>` and `<Company:Employee xmi.id="E005" firstName="Jane" lastName="Doe" title="Staff"/>` elements are children of the `<XMl.content>` element.

```
<?xml version="1.0" encoding="UTF-8"?>
<XMl xmi.version="1.1" timestamp="Mon Oct 20 16:16:25 EST 2000"
  xmlns:mof="schemas/MOF.xmi" xmlns:Company="schemas/company.xmi">
<XMl.header>
<XMl.model xmi.name="Employees"/>
<XMl.metamodel xmi.name="mof" xmi.version="1.0" href="schemas/MOF.xmi"/>
<XMl.metamodel xmi.name="Company" xmi.version="1.0" href="schemas/company.xmi"/>
</XMl.header>
<XMl.content>
  <Company:Employee xmi.id="E003" firstName="John" lastName="Smith" title="Staff"/>
  <Company:Employee xmi.id="E005" firstName="Jane" lastName="Doe" title="Staff"/>
</XMl.content>
</XMl>
```

FIG. 11

```
1100 <?xml version="1.0" encoding="UTF-8"?>
<XML xmi.version="1.1" timestamp="Mon Oct 20 16:16:25 EST 2000"
  xmlns:mof="schemas/MOF.xmi" xmlns:Company="schemas/company.xmi" xmlns:Employees="employees.xmi">
<XML.header>
<XML.model xmi.name="Figure 7 Before"/>
<XML.metamodel xmi.name="mof" xmi.version="1.0" href="schemas/MOF.xmi"/>
<XML.metamodel xmi.name="Company" xmi.version="1.0" href="schemas/company.xmi"/>
</XML.header>
<XML.content>
<Company:Department xmi.id="Clothing" name="Clothing"/> 1110
<Company:Department xmi.id="Shoes" name="Shoes"> 1120
  <Company:Department.employees>
    <Company:Employee href="employees.xmi#E003"/> 1130
  </Company:Department.employees>
</Company:Department>
</XML.content>
</XML>
```

FIG. 12

1200

```
<?xml version="1.0" encoding="UTF-8"?>
<XMI xmi.version="1.1" timestamp="Mon Oct 20 16:25 EST 2000"
  xmlns:mof="schemas/MOF.xmi" xmlns:Company="schemas/company.xmi"
  xmlns:Employees="employees.xmi">
<XMI.header>
  <XMI.model xmi.name="Figure 7 After"/>
  <XMI.metamodel xmi.name="mof" xmi.version="1.0" href="schemas/MOF.xmi"/>
<XMI.metamodel xmi.name="Company" xmi.version="1.0" href="schemas/company.xmi"/>
</XMI.header>
<XMI.content>
  <Company:Department xmi.id="Clothing" name="Clothing">
    <Company:Department.employees>
      <Company:Employee href="employees.xmi#E003"/>
    </Company:Department.employees>
  </Company:Department>
  <Company:Department xmi.id="Shoes" name="Shoes"/> 1220
</XMI.content>
</XMI>
```

1210

FIG. 13

1300

```
<?xml version="1.0" encoding="UTF-8"?>
<XML xmi.version="1.1" timestamp="Mon Oct 20 16:16:25 EST 2000"
      xmlns:mof="schemas/MOF.xmi" xmlns:Company="schemas/company.xmi" xmlns:Employees="employees.xmi">
<XML.header>
<XML.model xmi.name="Figure 8 Before"/>
<XML.metamodel xmi.name="mof" xmi.version="1.0" href="schemas/MOF.xmi"/>
<XML.metamodel xmi.name="Company" xmi.version="1.0" href="schemas/company.xmi"/>
</XML.header>
<XML.content>
<Company:Department xmi.id="Clothing" name="Clothing">
<Company:Department.employees>
<Company:Employee href="employees.xmi#E003"/> 1310
</Company:Department.employees>
</Company:Department>
<Company:Department xmi.id="Shoes" name="Shoes">
<Company:Department.employees>
<Company:Employee href="employees.xmi#E005"/> 1320
</Company:Department.employees>
</Company:Department>
</XML.content>
</XML>
```

1400

```
<?xml version="1.0" encoding="UTF-8"?>
<XML xmi.version="1.1" timestamp="Mon Oct 20 16:16:25 EST 2000"
  xmlns:mof="schemas/MOF.xmi" xmlns:Company="schemas/company.xmi" xmlns:Employees="employees.xmi">
<XML.header>
  <XML.model xmi.name="Figure 8 After"/>
  <XML.metamodel xmi.name="mof" xmi.version="1.0" href="schemas/MOF.xmi"/>
  <XML.metamodel xmi.name="Company" xmi.version="1.0" href="schemas/company.xmi"/>
</XML.header>
<XML.content>
  <Company:Department xmi.id="Clothing" name="Clothing">
    <Company:Department.employees>
      <Company:Employee href="employees.xmi#E003"/> 1410
      <Company:Employee href="employees.xmi#E005"/> 1420
    </Company:Department.employees>
  </Company:Department>
  <Company:Department xmi.id="Shoes" name="Shoes"/> 1430
</XML.content>
</XML>
```

FIG. 14

FIG. 15

1. If the end is a composite aggregation (aggregation by value), it is the primary end.
else
2. If an inverse exists and the inverse is a composite aggregation, then it is not the primary end.
else
3. If the end is a shared aggregation (aggregation by reference), it is the primary end.
else
4. If an inverse exists and the inverse is a shared aggregation, then it is not the primary end.
else
5. If the end is navigable,
5a. If an inverse exists and the inverse is navigable,
5a1. If the inverse is already the primary end, then this end is not the primary end.
else
5a2. If the end's multiplicity is many (upper bound is greater than 1), then it is the primary end.
else
5b. This end is the primary end.